Policy and barriers related to implementing adult e-learning in Taiwan

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The work quality of public servants direct affects a country's administrative performance, and the Taiwan government has recently invested a considerable amount of funds in constructing e-government learning platforms and developing digital courses to provide all public servants with sufficient on-the-job training and enhance the quality of human resources. Therefore, the circumstances under which public servants use e-government learning platforms warrant investigation. In this study, questionnaires were used to collect data for quantitative research, and a theoretical model was created to clarify the impact of 'Barrier Factors' and 'Policy Factors' on e-government learning. These factors have been examined inadequately in previous research on the theory of e-learning behaviour. The results presented here show that Barrier Factors and Policy Factors strongly influence the willingness of public servants to use e-learning systems, and these factors explain more than 80% of the variance in users' behavioural intention. These results revealed the characteristics of the research participants,

and the findings can be used as a reference in future studies and by management agencies responsible for providing e-government learning. Furthermore, these results might facilitate further research on and the practice of adult e-learning.

Keywords: *e-learning, adult learning, barrier factors, public servants, behavioural intention, structural equation modelling (SEM)*

Introduction

Over the past 10 years, Internet use has spread rapidly, influenced the manner in which people teach and learn (DeLacey & Leonard, 2002), and changed almost every aspect of peoples' lives. The education sector has not been immune to these changes, and technology has transformed classroom practices and learning processes (Kinshuk, Huang, Sampson, & Chen, 2013). Most prior studies on e-learning have emphasised learners' acceptance and use of e-learning platforms (Kao & Tsai, 2009; Liaw, Huang, & Chen, 2007). These studies focused on exploring various information technologies that were adopted by students and teachers and the features of e-learning. However, most of those studies examined and analysed e-learning as a part of instruction in schools (Chang & Tung, 2008; DeLacey & Leonard, 2002; Kao & Tsai, 2009). Thus, researchers have suggested that future research explore the disparities in learning amongst adults and full-time students (Chiu & Wang, 2008; Tsai, Shih, & Feng, 2008), and whether the motivations and methods for adult learning and classroom-based education are distinct is incompletely understood. Explaining developments and trends in adult education, previous research has revealed that national surveys that focus on the distribution and extent of adult learning provide useful information for policymakers, adult education providers, and the scholarly community (Lai & Wu, 2011). This topic has rarely been investigated, and Taiwan governments' use of the Internet to promote e-learning has been studied even less (Shyu & Huang, 2011). In this study, we evaluated public servants because their work quality directly affects the administrative efficiency of a nation. In addition, because of the high costs of e-government learning programs, the effectiveness of these programs must be evaluated.

Human resource management is a critical task of the public sector. High-quality public servants can be produced only through appropriate training, and e-learning curricula provide public servants with various course selection choices and participation opportunities, positively affecting public sector training and improving the capabilities of public servants. No comprehensive reference framework outlining the key factors that affect the behavioural intention of public servants to use e-learning systems has been developed. National policy leadership is required to unify efforts to promote adult learning (Nelson, Brennan, Berlin, Crombie, & Morris 2010); therefore, governments must understand the needs of learners and the challenges they encounter in using e-learning systems, in order to increase the use of these learning systems by designing curricula that meet learners' demands and usage situations that reduce the barriers encountered by learners. Thus, the difficulties public servants encounter when using e-government learning systems and the policies that governments can adopt to address these difficulties require investigation.

Adult students engaging in learning activities in a social context differ considerably from students in a school context. Specifically, these two types of student exhibit differences in purpose, motivation, work limitations, available time, and so on (Chang, Wu, & Lin, 2012).

The purpose of this study was to understand the challenges encountered by public servants who use an e-government learning system and to examine the effect of organisational policies on learners' willingness to use the system. The results of this study can therefore be used as a reference for future research and policy planning conducted by training organisations or agencies that offer adult e-learning.

Literature Review and Hypothesis Development

e-Learning, e-Government Learning, and Adult e-Learning Barriers

According to The American Society of Training and Development (ASTD), e-learning encompasses a wide range of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration as well as the transmission of curriculum content through the Internet, LAN/WAN, audio tapes and videotapes, satellite broadcasts, interactive TV, and CD-ROM (ASTD,

2005). Clark and Mayer (2003) defined e-learning as a method for transmitting teaching through computer-based media such as CD-ROM, the Internet, and intranets.

E-government learning refers to government-promoted learning that involves using network technology to improve the effectiveness of knowledge sharing and lifelong learning (Shyu & Huang, 2011). The Taiwan government recently developed several e-government learning platforms including HRD e-learning, which was established by the Directorate-General of the Personnel Administration, Executive Yuan mainly to train national public servants (as well as registered members of the public) throughout Taiwan. Established by the Taipei City Government, Taipei e-Campus is used primarily to train Taipei City Government personnel (as well as registered public servants from other agencies and the public). In addition, various other departments and local governments have established learning platforms. E-government learning is expected to provide broad and diverse learning courses designed to improve the quality of public servants and welcome public participation, thus facilitating the creation of a lifelong learning society.

Public servants who live and work with the double burden of having both a job and a family often feel that e-learning is beyond their grasp. Therefore, taking the time to learn requires either extrinsic or intrinsic motivation.

The barriers to e-learning include a lack of time to study, infrastructure, attitude, culture, physical unsuitability, lack of familiarity with e-learning methods, interruptions experienced during participation in courses, failure of e-courses to satisfy expectations, unattractive courses, and so on (Mousavi, Mohammadzadeh Nasrabadi, & Pezeshki-Rad, 2011; Mungania, 2003; Ali & Magalhaes, 2008; Gosling & Westbrook, 2004; Zielinski, 2000; Rossett, 2000). All of these factors can be learning obstacles.

If managers of e-government learning platforms were to recognise some or all of these user challenges and help resolve them, then overall e-government learning participation and satisfaction would likely increase.

Relationship between Attitude Towards Use and Behavioural Intention

Venkatesh, Morris, Davis, and Davis (2003) defined "Behavioural Intention" as the intensity of a person's willingness to engage in a specific behaviour, and the attitude towards using technology is defined as the overall affective reaction that a person exhibits towards using a system. Karaali, Gumussoy, and Calisir (2011) confirmed that user attitude significantly affects e-learning intention. Moreover, Liaw and Huang (2003) and Liaw, Chang, Hung, and Huang (2006) confirmed the effects of attitude on behavioural intention.

This study adopted the aforementioned perspectives and employed relevant scale items as a reference for questionnaire development; subsequently, these items were adjusted on the basis of the characteristics of e-government learning that are specific to public servants. The following hypothesis was proposed:

H1: Attitude Towards Use is positively correlated with public servants' Behavioural Intention to use e-government learning.

Relationships between Barrier Factors and Attitude Towards Use and Behavioural Intention

To execute policies effectively, resistance and barriers that affect policy implementation must be eliminated. Mousavi, Mohammadzadeh Nasrabadi, and Pezeshki-Rad (2011) investigated the barrier and inhibitor factors for implementation and development of e-learning in Payame Noor University, and identified seven factors including incompatibility of method and content, barriers related to access-skill, attitude, culture, credit and incentive, infrastructure, and incorporation of e-learning into the traditional educational system. Ali and Magalhaes (2008) investigated the barriers to implementing e-learning in companies and compiled the following key factors: cost, workload and a lack of time, insufficient managerial support, technological barriers, language barriers, and aversion to change. Gosling and Westbrook (2004) demonstrated that a lack of time is the most commonly reported reason for not using e-learning systems. According to Zielinski (2000) and Rossett (2000), the completion rates for e-learning training are low because of a lack of motivation, a lack of work relevance, poorly designed curriculum software, learning environments, the nature of

curricula, and learner preferences.

Mungania (2003) investigated e-learning barriers by studying 875 employees of U.S. and international organisations and proposed five primary features, namely time-management problems, adult pride, language problems, attitude towards e-learning, and learning styles or preferences. The time barriers included a lack of time to study, general problems in managing time, overcommitment to roles and responsibilities, and interruptions whilst studying. Content suitability barriers were an insufficient relevance of courses to work, poor course content, ambiguous course content, and the failure of course content to meet expectations.

According to the circumstances of Taiwanese public servants, this study examined specific items from the aforementioned studies, such as interruptions and interference during the learning process, the failure of course content to meet expectations, a lack of time to study, and unsuitable personal physiological or physical factors. "Barrier Factors" were defined as resistance to or situations affecting the use of an e-government learning system and were classified as "Personal Barriers", "Situational Barriers", and "Content Suitability Barriers". The following hypotheses were proposed:

H2: Barrier Factors are negatively correlated with the Attitude Towards Use of public servants in adopting e-government learning.

H3: Barrier Factors are negatively correlated with public servants' Behavioural Intention to use e-government learning.

Relationships between Policy Factors and Attitude Towards Use and Behavioural Intention

Policies are executed to achieve established administrative objectives. Previous research has shown that governmental agencies can act as key points of reference because their expectations affect personal acceptance of innovation (Lynne, Casey, Hodges, & Rahmani, 1995). Hardgrave, Davis, and Riemenschneider (2003) discovered that social pressure influences Behavioural Intention strongly and directly. By studying student willingness to participate in online forums, Yang, Li, Tan, and Teo (2007) determined that pressure from "significant" people in

students' lives encourages student participation in forums. Law, Lee, and Yu (2010) discovered that social pressure and competition are strongly and positively correlated with the effectiveness of e-learning.

Delgado (2009) confirmed that rewards are positive stimuli that affect daily behaviour. Grant (1989) claimed that personal motivation to learn increases only when learning is combined with rewards. Rosenberg (2001) asserted that incentives and rewards provided by organisations can increase the willingness of employees to participate in e-learning. Law, Lee, and Yu (2010) discovered that rewards and praise stimulate and encourage learning the most effectively. In addition, Jenkins (2001) asserted that combining appropriate rewards and praise can be a primary driving force in learning.

In summary, governmental (or affiliated organisational) pressure and reward policies can affect the willingness of public servants to use e-government learning systems. Therefore, relevant items from the aforementioned studies, such as policy pressure from government regulations mandating participation in e-government learning, organisational requirements or encouragement, and reward policies, were examined. "Policy Factors" were defined as pressure or reward policies affecting the use of e-government learning systems and were classified as "Incentive Policies" and "Pressure Policies". The following hypotheses were proposed:

H4: Policy Factors are positively correlated with the Attitude Towards Use of public servants in adopting e-government learning.

H5: Policy Factors are positively correlated with public servants' Behavioural Intention to use e-government learning systems.

Research Model

Based on the literature review and the purpose of this research, a research model was constructed using four constructs: Barrier Factors, Policy Factors, Attitude Towards Use, and Behavioural Intention.

Figure 1. Research model of this study (summarized by the author)
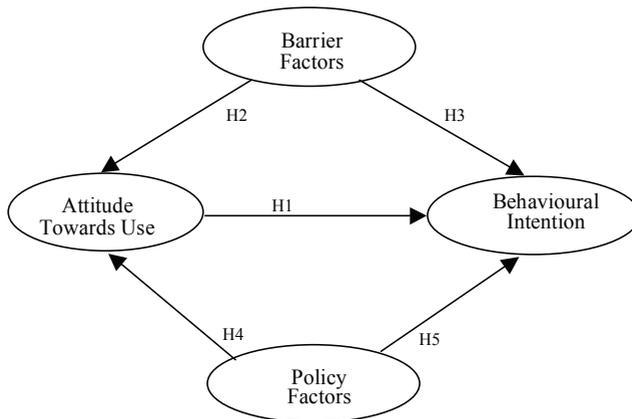
Methods

Participants

This study examined the factors that affect the use of e-government learning systems by public servants in Taiwan. Because public servants were not required to participate in e-learning, this study was considered a study of individual behaviour and adopted a random sampling method; thus, the questionnaire was distributed to a diverse sample during the sampling period, preventing the sampling ratio from being dissimilar because of variations in sectors or functions. HRD e-learning and Taipei e-Campus are learning platforms primarily used by public servants in central government agencies and Taipei City Government. A survey was administered over 1 month to public servants who had used e-government learning in Taiwan. The online surveys were conducted to examine HRD e-learning and Taipei e-Campus. Questionnaires containing incomplete answers were excluded, and 423 valid questionnaires were collected.

Instrument

During the pre-study, data were collected using semi-structured interviews to determine and summarise the key factors that influence

the intention of public servants to use e-government learning systems, including attitude, barriers, pressure, and incentives. These findings enabled us to further explore the literature and develop a research model. In other words, this research model was derived from information obtained from semi structured interviews and a literature review. A literature review was conducted to identify theories relevant to the research, and the questionnaire was used to collect data for quantification. Theoretical applicability was then verified, and practical suggestions were proposed to resolve problems. The first portion of the questionnaire developed in this study was designed to measure factors related to the research model structure, and the second portion was used to collect respondents' personal information. Except for the questions related to personal information, all items were ranked on a 7-point Likert scale. Appendix A describes the questionnaire items in detail.

To ensure the reliability and validity of the measurement tools, this study adopted scales developed previously (Hsieh, Rai, & Keil, 2008; Law et al., 2010; Mungania, 2003; Venkatesh et al., 2003, 2008; Wang, Wu, & Wang, 2009). After the questionnaire items were revised according to the topics and participants of this study and then translated and back translated, several public servants were invited to complete a pretest. To examine the reliability of the questionnaire further, 125 additional public servants were asked to complete a pilot test, which entailed administering a revised version of the pretest questionnaire. SPSS software was used to analyse the items in the returned questionnaires. The factor loadings of all items exceeded 0.5 and, thus, were acceptable; therefore, the full questionnaire was employed in formal testing.

To determine the robustness and reliability of the constructs measured using the scale in this study, cross validation was employed according to the recommendation of Anderson and Gerbing (1988).

The data sample was randomly divided into two groups by using SPSS 12.0. The first group (220 samples) was subjected to exploratory factor analysis (EFA) to establish the research model, and the second group (203 samples) was subjected to confirmatory factor analysis (CFA) for verification. Finally, all 423 samples were subjected to structural equation modelling (SEM) analysis to determine the overall distribution

of the study samples.

EFA was conducted to compress multiple observed variables into several refined variables. Principal factor analysis was used to extract the key factors, and Varimax was used to determine the primary items for measuring various factors and, ultimately, common factors with an eigenvalue greater than 1 were selected. Three barrier factors with an eigenvalue greater than 1 were extracted from nine items after factor analysis. The three barrier factors, which had an accumulated explained variance of 68.170% and individual item factor loadings that were all greater than 0.5, were considered Content Suitability Barriers, Personal Barriers, and Situational Barriers according to the literature. Two policy factors were extracted from six items after factor analysis; these two factors had an accumulated explained variance of 79.204%, and all individual item factor loadings were greater than 0.5. These factors were considered Pressure Policies and Incentive Policies according to the literature.

To confirm the suitability of the factor structure obtained using EFA, the second group of data (203 samples) was subjected to CFA.

Results

Descriptive Analysis

Of the 423 respondents who submitted valid samples, 193 were men (45.6%) and 230 were women (54.4%). Table 1 provides additional information regarding the participants.

Table 1: *Frequency distribution of basic data*

		Amount/ Frequency	Percentage	Cumulative Percentage
1. Gender	1. Male	193	45.6	45.6
	2. Female	230	54.4	100.0
2. Age	1. 29 or younger	32	7.6	7.6
	2. 30-39	114	27.0	34.5
	3 . 40-49	178	42.1	76.6
	4. 50 or older	99	23.4	100.0

3. Education level	1. High school or vocational	23	5.4	5.4
	2. Undergraduate	266	62.9	68.3
	3. Graduate or above	134	31.7	100.0
4. Job Position	1. Manager	87	20.6	20.6
	2. Non-manager	336	79.4	100.0
5. Learning autonomy	1. Autonomously	276	65.2	65.2
	2. Non-autonomously	147	34.8	100.0

Analysis of the Measurement Model

We used the SEM method to verify the construct validity of the proposed model and our hypothesis; we then tested the goodness of fit of the research model. In addition, we used CFA (an analytical method involved in SEM) to evaluate the construct reliability and validity and to determine whether the measurement tools exhibited between-group invariance. Thompson (2004) indicated that, before structural model analysis is performed using SEM, the measurement model must be analysed to ensure that it accurately reflects the study dimensions and factors.

Kline (2005) proposed a two-step modelling method in which the measurement model is tested prior to structural model analysis. The second step in the analysis is initiated only when the measurement model achieves an acceptable goodness of fit, enabling a complete analysis of the structural equation model.

Amos 7.0 (a programming language that is easy to use and enables easy comparing, confirming, and refining structural equation models) was used to test and verify the fit of the research model. During data analysis, when the internal maximum likelihood method is used to estimate parameters, the data must conform to the assumptions of a multivariate normal distribution. Moreover, the sample size must be at least 100–150 before the internal maximum likelihood method can be applied (Ding, Velicer, & Harlow, 1995). With 423 valid samples,

this study conformed to this standard. Furthermore, the skew and kurtosis coefficients must be between +2 and -2 to conform to the normal distribution test proposed by Mardia (1985). Anderson and Gerbing (1988) and Williams and Hazer (1986) recommend that every research construct and measurement item be subjected to Cronbach's α coefficient analysis and that every research construct and measurement item be subjected to CFA during the first stage of SEM analysis to determine the reliability, convergent validity, and discriminant validity of each construct.

Analysis of the Structural Model

At the second stage, the structural model should be analysed to verify each hypothesis in the conceptual model. Structural model analysis involves analysing the research model fit and explanatory power of the entire model.

Many indices can be used to evaluate the fit of a model, but no single index can serve as the only standard for judging the quality of a model. A number of descriptive-fit indices have been proposed mostly in the 1970s and 80s that provide a family of fit measures useful in the process of assessing model fit.

Bollen (1989), Bollen and Stine (1992), Etezadi-Amoli and Farhoomand (1996), Bentler and Bonnett (1980), Bentler (1990), and Hair, Black, Babin, Anderson, and Tatham (2005) were referenced in selecting the following indices to evaluate the fit of the entire model: χ^2/df, the goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), nonnormed fit index (NNFI), comparative fit index (CFI), and root mean square error of approximation (RSMEA). (1) $\chi^2/d.f.$ should be less than 5; (2) GFI should be more than 0.8; (3) AGFI should be more than 0.8; (4) NFI should be more than 0.9; (5) NNFI should be more than 0.9; (6) CFI should be more than 0.9; and (7) RMSEA should be less than 0.08. In general, the closer the observed data is to the theoretical model, the better the fit of the model, and the easier it will be to satisfy the thresholds of the above indices. If the threshold of an index cannot be met, it means the model must be modified.

Table 2 lists the results. All indices achieved their respective standards, indicating that the research model fit the collected data well.

Table 2: *Fit indices*

| Index	Fit	Literature Source	Research Model
χ^2/d.f.	1-5	Bollen (1989)	3.280
GFI	> 0.8	Etezadi-Amolo and Farhoomand (1996)	0.882
AGFI	> 0.8		0.848
NFI	> 0.9	Bentler and Bonnett (1980)	0.911
NNFI(TLI)	> 0.9	Bentler (1990)	0.925
CFI	> 0.9	Hair et al. (2005)	0.936
RMSEA	< 0.08		0.073

Hypothesis Testing

The path relationships between constructs were estimated using Structural Equation Modelling, and a standardised coefficient was adopted for the path values. This analysis verified that all hypotheses in the research model achieved a significance level of $\alpha = 0.001$, evidencing that the research model fit the collected data accurately. Table 3 and Fig. 2 show the path-analysis coefficients for the structural model used in this study. The estimated squared multiple correlation (SMC) value for the structural model demonstrated that the independent latent variables explained 50.8% of the variance in Attitude Towards Use and 81.9% of the variance in Behavioural Intention, exhibiting a good explanatory power.

Table 3: *Hypothesis verification*

Hypothesis Number	Path Value	Result
H1: Attitude Towards Use →Behavioural Intention	0.674***	support
H2: Barrier Factors →Attitude Towards Use	-0.197***	support
H3: Policy Factors →Attitude Towards Use	0.685***	support
H4: Barrier Factors →Behavioural Intention	-0.138***	support
H5: Policy Factors →Behavioural Intention	0.260***	support

* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2. Path analysis of the research model (summarized by the author)
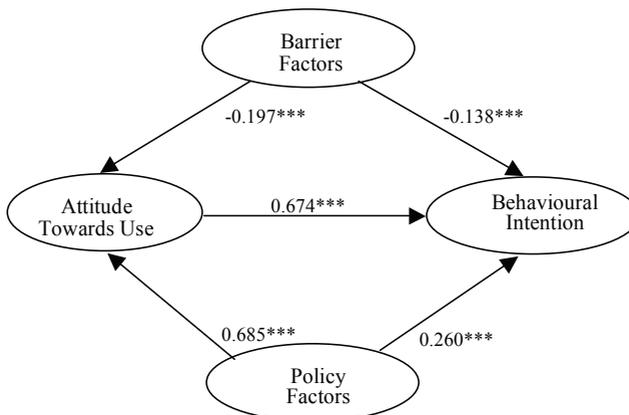
Discussion

In this study, the literature was reviewed to identify theories relevant to the research, and questionnaires were used to collect data for quantification. Theoretical applicability was verified and practical suggestions were proposed to resolve problems.

The cross validation approach was adopted to increase the robustness and reliability of the qualities measured according to the Likert scale. The collected data were divided randomly into two sample groups. The first group was subjected to EFA to construct a research model, and the second group was subjected to CFA to test and verify the model. This research process was particularly rigorous.

The estimated SMC value for the structural model demonstrated that the independent latent variables explained 50.8% of the variance in Attitude Towards Use and 81.9% of the variance in Behavioural Intention. All indices used for evaluating the fit of the entire model, including the $\chi2/d.f.$, GIF, AGFI, NFI, NNFI, CFI, and RMSEA, achieved established standard values, indicating that the model fit the observations accurately.

The dimensions of Barrier Factors were Personal Barriers, Content Suitability Barriers, and Situational Barriers, and the dimensions of Policy Factors were Incentive Policies and Pressure Policies. Numerous structural model standardised coefficients revealed the key factors that affect the use of e-government learning systems by public servants. Behavioural Intention was affected by Attitude Towards Use (0.67), Policy Factors (0.26), and Barrier Factors (-0.14); the effects of Policy Factors were revealed by Incentive Policies (0.97) and Pressure Policies (0.62), and the effects of Barrier Factors were shown by Personal Barriers (0.75), Situational Barriers (0.64), and Content Suitability Barriers (0.68). The Behavioural Intention of users was positively influenced by Attitude Towards Use and Policy Factors and negatively influenced by Barrier Factors, and Attitude Towards Use was positively influenced by Policy Factors and negatively influenced by Barrier Factors. Personal Barriers, which include a lack of time to study and personal physical unsuitability, exerted the greatest impact of the Barrier Factors. Situational Barriers included unfamiliarity with e-learning methods, interruptions in courses, and the inability to

complete courses. Content suitability barriers included the failure of e-courses to meet expectations and unattractive courses, which were learning obstacles. It shows that: The Incentive Policy factor is a more effective policy than the Pressure Policy factor; governments should adopt policies to encourage the Personal Barrier factor. The Situational Barrier factor might be improved using advanced information technology; governments should dedicate effort to improving the Content Suitability Barrier factor.

Attitude Towards Use significantly affected the Behavioural Intention, indicating that authorities who adopt e-government learning systems must heavily promote such systems to enhance the positive attitudes and use behaviours of public servants. Because public servants have a high level of job security, receive limited promotion opportunities, are constantly busy, and must support their families, they cannot typically undergo undisturbed learning to expand their skills. If these public servants are not pressured or offered proper incentives, then their learning intention is likely to remain low. Currently, the Personnel Administration requires public servants to complete 14 hours of e-learning per year as a reference for annual performance appraisals. Because there are no punishment provisions, no absolute force is imposed; however, this requirement still plays a role in policy effects.

The government can motivate public servants to take learning courses by including an annual learning hour count as a criterion for employee appraisal or by rewarding public servants who take learning courses with commendations, bonuses, or vacation days. Such incentives would facilitate enhancing learning intentions.

The aforementioned results suggest that the authorities responsible for providing e-government learning must adopt appropriate policies to strengthen learners' intention to use e-learning systems. Factors that interfere with the learning process are the primary barriers to learning in offices; therefore, dedicated learning environments and times should be planned to ensure that public servants are not disturbed whilst learning. Online counselling must be increased to enhance public servants' digital learning and their confidence in participating in digital learning, and incentives should be offered to increase participation in digital learning. Moreover, digital learning platforms and digital

course content must be strengthened to meet the requirements of public servants. Another crucial barrier cited was a lack of time, which might reflect excessive workloads or might only be an excuse; therefore, regulatory authorities should investigate the underlying reasons for this barrier in depth.

Conclusion

The purposes of this study were to identify the factors that promote and hinder participation in e-learning by public servants and to understand the learning behaviours specific to public servants.

To increase the use of e-government learning platforms, this study offers the following practical recommendations to agencies that manage e-learning for public servants:

1. Reduce the factors that cause learning barriers: Interruptions and interference during the learning process were the most common learning barriers in the office. If dedicated learning environments and times were arranged during office hours, then users would be less distracted by work and learning would be facilitated. Professionals who promote digital learning (such as e-facilitators and e-tutors) should receive rigorous training to help users adapt to online learning and to eliminate learners' uncertainties regarding using e-learning systems. Another crucial barrier, lack of time, can be attributed to excessive workloads, but may also be used as an excuse. Thus, management agencies must understand the reasons for these barriers in greater depth.

2. Increase course content diversity, practicality, convenience, and fun: In addition to courses on policies and job-related legal topics, courses on language and culture, self-growth, and management should be provided to improve the competence and humanism of public servants. To enhance the convenience of learning in the mobile era, we suggest replicating the modular course design employed by Harvard Macy Institute (Harvard Macy Institute programs); each module contains a video as well as learning clues and a learning outcome assessment. The module length was controlled to within 12 minutes. This enabled the learners to maintain their focus, meeting the course demands of users.

3.   Establish appropriate reward and punishment measures: Because Policy Factors have a substantial impact on the Behavioural Intention, the promotional bureau or agency of the learning department should establish diverse reward and punishment measures to increase the frequency with which public servants use e-government learning systems. For example, the Directorate-General of the Personnel Administration can mandate that public servants complete a specified number of hours of e-learning per year and link this mandate to the A-level threshold in performance appraisals; provide awards and recognition to every public servant who surpasses a certain number of e-learning hours annually; or formulate and offer tangible rewards and incentives such as sweepstakes and prize drawings or learning-hours-for-vacation promotions.

4.   Reward competence in the administrative authority: The success of organisational learning depends on the competence of the people who provide support. Therefore, to encourage competence in assisting public servants and in providing e-government learning services, incentives should be offered to e-government learning providers.

5.   If the management agencies responsible for the e-government learning systems used by public servants monitor learners and help resolve the challenges they face, design courses and usage situations that satisfy learners' requirements, and implement appropriate reward and punishment policies, then overall use of systems is likely to increase.

Contribution

This study provides the following contributions:

1.   Regarding theoretical contributions, we established a model and verified that Attitude Towards Use, Barrier Factors, and Policy Factors are associated with the Behavioural Intention. The factors explored in this study, barriers and policies, have rarely been examined in previous research on the theory of e-learning acceptance and usage behaviour; here, these factors explained more than 50% of the variance in Attitude Towards Use. Additional, this

study involved measuring the e-learning behaviour of adults (public servants), who constitute a group distinct from students, and thus fills a gap in academic research on learning.

2. Regarding practical contributions, the results indicate that authorities should to adopt suitable policies that encourage adult learners to enhance their learning motivation. The results of this study, which revealed the learning characteristics of the research participants, can serve as a reference for future researchers and also for agencies that manage e-government learning. Furthermore, these results may help enhance studies on and the practice of adult learning.

3. The cross-validation approach was adopted to increase the robustness and reliability of the qualities measured according to the Likert scale. The collected data were divided randomly into 2 sample groups. EFA was conducted on the first group to construct a research model, and CFA was conducted on the second group to test and verify the model. This research process was particularly rigorous, can serve as a reference for future researchers.

4. Taiwanese culture is a hybrid blend of various cultures in the Greater China area; therefore, although our research participants were from Taiwan, our results can be used as a reference for populations in the Greater China area of Asia.

This study focused on the individual level to determine factors that affect individual e-learning. The results can serve as a practical reference for adult educators, providing policy makers with clearer ideas on crafting practical solutions for improving learning environments and opportunities for adults. The results of this study enrich the e-learning literature as well as the practice of e-learning and facilitate enhancing research on and the practice of adult learning; thus, conforming to the research purpose.

Limitations and Further Research

Although the Attitude Towards Use, Barrier Factors, and Policy Factors, explained more than 80% of the variance in the Behavioural Intention, the explanatory power for Attitude Towards Use (50.8%)

was insufficient. We recommend that constructs from other theoretical models be combined in future research to improve the explanatory power for Attitude Towards Use. Furthermore, the gender, age, education level, job position, and learning autonomy of participants can be subjected to extraneous variable analysis to determine whether these factors influence the Behavioural Intention distinctly.

In addition, we conducted a cross-sectional analysis of a single group. Future research can adopt a longitudinal study design or include e-learners other than public servants, such as business people, to evaluate the general applicability of the theoretical model developed here.

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Appendix A

Constructs	Operational Definition	Source	Measure	Adapted Measure
Barrier Factors				
Situational Barriers	Situational barriers relate to the employee's environment and life's circumstances and are the most prevalent barriers	Penina Mungania (2003)	1. Interruptions during learning especially in the office made learning difficult. 2. E-learning lacks the personal interface with other students and instructor. 3. E-learning is not suitable for all courses.	1. Interruptions during learning especially in the office made learning difficult. 2. The e-government learning lacks the personal interface with other students and instructor. 3. The e-government learning is not suitable for all courses.
Content Suitability Barriers	Learner expectations of the course Course relevance Content not audience-specific Poor content quality and limited rigor Poorly constructed assessments	Penina Mungania (2003)	1. The courses offered were not relevant or applicable to their job. 2. The content covered is not specific enough. 3. Courses offered were not those I desired.	1. The courses offered were not relevant or applicable to job. 2. The content covered is not specific enough. 3. Courses offered were not those I desired.
Personal Barriers	Time management problems Adult pride Language problem Attitude towards e-learning Learning style or preferences	Penina Mungania (2003)	1. Finding the time for study was a barrier. 2. Physical health barriers such as eye strain, carpal tunnel syndrome, or physical immobility. 3. Psychological barriers such as anxiety or stress.	1. Finding the time for study was a barrier. 2. Physical health barriers (such as eye strain etc.) made e-government learning difficult. 3. Psychological barriers such as anxiety or stress made e-government learning difficult.

Policy Factors	The policy factor was defined as the pressure or incentive policies that affect behavioural intentions regarding the adoption of e-government learning systems	1.Hsieh et al.(2008) 2.Kris M.Y. Law, Victor C.S. Lee , Y.T. Yu (2010)	1. The city government thinks that I should use the Internet TV. 2. The pressure from teacher forces me to learn better and work harder. 3. The pressure from my classmates pushes me to learn better. 4. My performance will be further improved when my good performance is appraised positively by others. 5. I will be motivated to learn better on Web-based learning when appropriate reward (e.g., bonus points and higher marks) is given. 6. The instructor's on Web-based learning encouragement and good comment on me motivate me to learn.	1. The government thinks that I should use the e-government learning. 2. The pressure from government policy (less 15 e-learning hours) forces me to learn better and harder. 3. The pressure from my organization pushes me to learn better. 4. My performance will be further improved when my good performance is appraised positively by others. 5. I will be motivated to learn better on e-government learning when appropriate reward (e.g., bonus points and higher marks) is given. 6. The instructor's on e-government learning encouragement and good comment on me motivate me to learn.
Attitude towards use	Attitude toward using technology is defined as an individual's overall affective reaction to using a system	Venkatesh et al.(2003)	AU1: Using the system is a bad/good idea. AU2: The system makes work more interesting. AU3: I like working with the system.	1. Using the e-government learning is a good idea. 2. The e-government learning makes learning more interesting. 3. I like learning with the e-government learning system.

Behavioural Intention	Behavioural intention to use is a measure of the strength of one's willingness to try while performing certain behaviours	Venkatesh et al.(2003)	BI1: I intend to use the system in the next \<n\> months. BI2: I predict I would use the system in the next \<n\> months. BI3: I plan to use the system in the next \<n\> months.	1. I intend to use the e-government learning in the next 6 months. 2. I predict I would use the e-government learning in the next 6 months. 3. I plan to use the e-government learning in the next 6 months

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